Meeting Minutes
Operable Unit Seven
IM/IRA Strategies
Passive Seep Interception and Treatment System Construction

January 18, 1996

Objectives

The objectives of the meeting were to: 1) present the database used to perform the evaluation of alternatives for groundwater remediation 2) discuss the relevancy of previous assumptions based on resolution of sitewide issues and 3) provide a status of the Passive Seep Interception and Treatment System construction.

Background Presentation

The operational and regulatory background of Operable Unit Seven was presented to familiarize meeting participants with the previous assumptions and decisions affecting the closure process.

Database for Evaluation of Alternatives

The base of analytical data used for the evaluation of alternatives was presented and discussed (see attachment 2). At the present time, the alluvial wells (4087, 53194) downgradient of the source area indicate that iron, lead, manganese, fluoride and sulfate ARARs are exceeded. None of these contaminants, if present in a surface water environment, present an unacceptable risk to an open-space recreational user. At the point of compliance (4087) modeling indicates that no other compounds will exceed ARARs during the 30 year post closure care period.

The groundwater budget for the OU 7 source area was also discussed. The model was recalibrated and approximately 60% of the recharge to the source area is from infiltration. This model is based on March 1993 data which was a low flow month. Modeling indicates that the saturated thickness of the source area is decreased from 15 to 8 feet with a cap only scenario and reduced from 15 to 4 feet of saturated thickness with a cap and slurry wall option.

In the December 19, 1995 meeting, OU 7 agreed to evaluate the OU 6 groundwater contaminants for possible treatment/management under the OU 7 interim measure. The OU 6 contaminants were reviewed and if the OU 6 groundwater strategy were to be incorporated into the OU 7 interim measure, 12 contaminants not previously addressed would require further study. Also, OU 6 is a purely CERCLA site whereas OU 7 is a RCRA Management Unit. All parties agreed to remove OU 6 groundwater from the OU 7 interim measure. OU 6 groundwater will be addressed by the Sitewide Groundwater Strategy.

CDPHE stated that background comparison arguments have been accepted previously and OU 7 should provide similar information for those compounds were are naturally occurring.

The appropriate scenario for the no action alternative/CERCLA baseline was defined. The baseline alternative have no administrative controls, including land use restrictions.

A summary of OU 7 Options and Alternatives was presented (see attachment 3). Conceptual information concerning reactive barriers was also presented. Reactive barriers are efficient at removing short chained carbon compounds and will reduce Fe, Mn, and other trace metals. Reactive barriers will not removed ringed compounds such as benzene, naphthalene, and 2-methylnapthalene identified as groundwater potential contaminants of concern.

The impact on ARARS from the adoption of Option B was discussed. Option B is a DOE funded project to ensure that downstream public water supplies are not affected by surface water leaving RFETS. Option B includes two subprojects, the Great Western Reservoir Replacement Project and the Woman Creek Reservoir Project. Through the Great Western Reservoir Replacement Project, a pipeline is being constructed to carry water from Carter lake to a new water treatment facility to supply potable water to the City of Broomfield. Construction of the pipeline and water treatment facility is scheduled for completion in mid 1997. At that time, Great Western Reservoir will no longer be used as a water supply reservoir by the City of Broomfield. Through the Woman Creek Reservoir Project a new reservoir has been constructed on Woman Creek immediately downstream of RFETS to collect Woman Creek flows prior to testing and batch release into Walnut Creek. Water acceptable for discharge will be pumped North to the Broomfield Diversion Ditch and will flow downstream into Walnut Creek. After completion, the water use classification will be changed to remove human health based and domestic water supply standards. The applicable aquatic life standard is class 2, warm. It was agreed that the IM/IRA document should present these changes in ARARs and also remove MCLs as relevant and appropriate standards. The only applicable use classification for Groundwater is protection of surface water.

Discharge options were discussed at length. The two possible scenarios are discharge to surface water and discharge to groundwater. A risk assessment of the groundwater using a surface water pathway was performed. Risk to an open-space recreational use is acceptable. There is an ecological risk to mallards, raccoons and coyotes from napthalene and 2-methylnapthalene.

Status of Seep Interception and Treatment System

The delays encountered in design and fabrication of the carbon steel tank were presented. Review of the carbon steel tank design had revealed a customized shoring application and a Professional Engineering stamp is required by OSHA. In addition structural design changes were required to address buoyancy and integrity issues. Based on the duration required to resolve these issues, the carbon steel tank will not be delivered to the site until February 2, 1996. With this delivery date and the remaining duration of construction activities, the Passive Seep Interception and Treatment system will be operational February 21, 1996, barring any unforeseen circumstances.

The milestone of "System Operational" is no longer listed as an IAG milestone. Accordingly, it is no longer necessary for EPA/CDPHE to approve requested extensions. Kaiser-Hill/DOE-RFFO will keep EPA/CDPHE informed of any project changes.

Summary of ARARs Comparison for OU7 / OU6 Wells and Surface Water

		LOCATION							
Analyte Exceeding ARARs	Total / Dissolved	OU 6 Alluvial Wells	OU 6 Weathered Bedrock Wells	Well 72293 (Alluvial)	Seep	ELP	Down-gradient Alluvial Wells	Down-gradient Weathered Bedrock Wells	Modeled Concen-trations at Point of Compliance
Metal									
ARSENIC	TOTAL			x					
BARIUM	TOTAL	x							
BERYLLIUM	TOTAL	x							
CADMIUM	TOTAL	x							
CHROMIUM	TOTAL	x							
COPPER	TOTAL	x							
IRON	DISSOLVED			x	x	x	x		x
LEAD	TOTAL	x					x		
MANGANESE	TOTAL	x		x	x	x			
MANGANESE	DISSOLVED			x	x	x	x	x	
NICKEL	TOTAL	x							
SELENIUM	TOTAL	x	x						
SILVER	TOTAL	x							
ZINC	TOTAL	x			x				
Radionuclides									
GROSS ALPHA	TOTAL	x	x					x	
GROSS BETA	TOTAL	x	x	x	x	x		x	
URANIUM-233,-234	TOTAL		x						
Semivolatile Organics									
BIS(2-ETHYLHEXYL)PHTHALATE	TOTAL	x		x					
Volatile Organics									
BENZENE	TOTAL	x		x	x				
CARBON TETRACHLORIDE	TOTAL	x						x	
CHLOROFORM	TOTAL	x							
CHLOROMETHANE	TOTAL				x				
METHYLENE CHLORIDE	TOTAL			x	x	x			
NAPHTHALENE	TOTAL			x	x				
TETRACHLOROETHENE	TOTAL	x		x					
TRICHLOROETHENE	TOTAL	x		x					
VINYL CHLORIDE	TOTAL			x	x				
Water Quality Parameters									
FLUORIDE	TOTAL		x	x			x		
NITRATE/NITRITE	TOTAL							x	
SULFATE	TOTAL						x	x	

ARARS Comparison for Wells Near OU 6 IHSSs

Analyte	Total / Dissolved	Location	Geologic Unit	Detection Limit Range	Detection Frequency	ARAR	Number of Detections Exceeding ARAR	Minimum Result	Mean Result	UCL_{95}	Maximum Detection	Qualifier for Maximum Detection	Validation for Maximum Detection	Units
Metal														
BARIUM	TOTAL	7287	ALLUVIAL	2.1 - 200	6/6	1000.0	2	245.0	1385.0	2989.41	5060.0	--	V	UG/L
BERYLLIUM	TOTAL	7287	ALLUVIAL	0.8 - 5	4/6	2.0	2	1.0	8.0	18.79	32.0	--	V	UG/L
CADMIUM	TOTAL	7287	ALLUVIAL	2 - 5	4/6	5.0	2	2.2	7.0	13.61	19.0	--	JA	UG/L
CHROMIUM	TOTAL	7287	ALLUVIAL	2.4 - 10	5/6	50.0	2	19.7	148.0	334.71	560.0	N*	V	UG/L
COPPER	TOTAL	7287	ALLUVIAL	2 - 25	6/6	1300.0	2	38.0	1578.0	3609.20	6430.0	--	V	UG/L
LEAD	TOTAL	7287	ALLUVIAL	1 - 3	6/6	50.0	2	5.2	53.0	116.82	193.0	--	V	UG/L
MANGANESE	TOTAL	7287	ALLUVIAL	1 - 15	6/6	200.0	3	120.0	1606.0	3646.45	6200.0	--	V	UG/L
NICKEL	TOTAL	7287	ALLUVIAL	11 - 40	6/6	100.0	2	20.1	287.0	632.11	1070.0	--	V	UG/L
SELENIUM	TOTAL	7087	ALLUVIAL	5 - 5	2/2	20.0	1	15.3	18.0	36.14	21.0	--	V	UG/L
SELENIUM	TOTAL	B206589	W. BEDROCK	2 - 5	7/7	20.0	7	31.7	39.0	43.00	45.8	S	V	UG/L
SELENIUM	TOTAL	B206689	W. BEDROCK	5 - 5	1/1	20.0	1	220.0	220.0	NC	220.0	--	V	UG/L
SILVER	TOTAL	7087	ALLUVIAL	10 - 10	2/2	70.0	2	103.0	208.0	870.97	313.0	--	V	UG/L
SILVER	TOTAL	7287	ALLUVIAL	2.6 - 10	6/6	70.0	4	64.2	899.0	1907.63	3040.0	--	V	UG/L
ZINC	TOTAL	7287	ALLUVIAL	2.1 - 20	6/6	2000.0	2	116.0	2162.0	4730.21	8000.0	--	V	UG/L
Radionuclides														
GROSS ALPHA	TOTAL	7287	ALLUVIAL	7.38183 - 59.3332	2/2	15.0	1	12.8	129.4	865.21	245.9	C	Y	PCI/L
GROSS ALPHA	TOTAL	B206589	W. BEDROCK	2.5 - 2.5	1/1	15.0	1	49.6	49.6	NC	49.6	--	V	PCI/L
GROSS BETA	TOTAL	7287	ALLUVIAL	6.76049 - 56.5247	2/2	8.0	2	19.2	127.7	813.11	236.3	C	Y	PCI/L
GROSS BETA	TOTAL	B206489	ALLUVIAL	2.8 - 4.38941	2/2	8.0	1	3.4	3122.7	22817.74	6241.9	C	V	PCI/L
GROSS BETA	TOTAL	B206589	W. BEDROCK	2.66 - 2.66	1/1	8.0	1	16.3	16.3	NC	16.3	--	V	PCI/L
URANIUM-233,-234	TOTAL	B206589	W. BEDROCK	0.25 - 0.25	1/1	20.0	1	35.4	35.4	NC	35.4	--	V	PCI/L
Semivolatile Organics														
BIS(2-ETHYLHEXYL)PHTHALATE	TOTAL	7287	ALLUVIAL	10 - 10	2/2	10.0	1	1.0	7.0	41.23	12.0	B	Y	UG/L
Volatile Organics														
BENZENE	TOTAL	B206489	ALLUVIAL	0.2000 - 10	1/15	1.0	1	0.2	3.0	3.16	2.0	J	A	UG/L
CARBON TETRACHLORIDE	TOTAL	7287	ALLUVIAL	0.3000 - 10	9/14	1.0	9	2.0	4.0	5.49	12.0	D	Y	UG/L
CHLOROFORM	TOTAL	7287	ALLUVIAL	0.2000 - 10	11/13	6.0	2	2.0	4.0	5.11	10.0	D	Y	UG/L
TETRACHLOROETHENE	TOTAL	7087	ALLUVIAL	5 - 5	3/10	1.0	2	0.8	2.0	2.67	3.0	J	A	UG/L
TETRACHLOROETHENE	TOTAL	7287	ALLUVIAL	0.2000 - 10	14/15	1.0	14	2.0	5.0	6.28	14.0	D	Y	UG/L
TETRACHLOROETHENE	TOTAL	B206489	ALLUVIAL	0.2000 - 10	10/15	1.0	6	1.0	2.0	2.80	2.0	J	A	UG/L
TRICHLOROETHENE	TOTAL	7287	ALLUVIAL	0.2000 - 10	15/15	2.7	15	24.0	58.0	79.54	190.0	D	Y	UG/L
TRICHLOROETHENE	TOTAL	B206489	ALLUVIAL	0.2000 - 10	15/15	2.7	15	16.0	24.0	27.98	41.0	--	V	UG/L
Water Quality Parameters														
FLUORIDE	TOTAL	B206689	W. BEDROCK	100.0 - 100.0	13/13	2000.0	6	1900.0	2085.0	2169.85	2400.0	--	V	UG/L

NC - Not Calculated

Shaded cell indicates value exceeds ARAR; comparison of UCL_{95} to ARAR is not performed if UCL_{95} exceeds Maximum Detection.

ARARS Comparison for Alluvial Well 72293

Analyte	Total / Dissolved	Detection Limit Range	Detection Frequency	ARAR	Number of Detections Exceeding ARAR	Minimum Result	Mean Result	UCL_{95}	Maximum Detection	Qualifier for Maximum Detection	Validation for Maximum Detection	Units
Metals												
ARSENIC	TOTAL	1.2 - 10	8/8	50.0	2	8.5	33.9	51.5	74.7	--	V	UG/L
IRON	DISSOLVED	2.0 - 100	9/9	300.0	9	30100	52900	76559	146000	--	V	UG/L
MANGANESE	DISSOLVED	1 - 15	9/9	50.0	9	1160	2617	4054	8320	--	V	UG/L
MANGANESE	TOTAL	1 - 15	8/8	200.0	8	1260	2749	4267	8000	N	JA	UG/L
Radionuclides												
GROSS BETA	TOTAL	12.8 - 12.8	1/1	8.0	1	47.1	47.1	NC	47.1	--	V	PCI/L
Semivolatile Organics												
BIS(2-ETHYLHEXYL)PHTHALATE	TOTAL	10 - 12	1/10	10.0	1	10	10.0	18.4	11.0	--	V	UG/L
Volatile Organics												
BENZENE	TOTAL	0.2000 - 10	5/10	1.0	3	0.6	5.0	9.2	4.0	J	A	UG/L
METHYLENE CHLORIDE	TOTAL	0.2000 - 10	2/10	4.7	0	3.0	5.0	9.5	4.0	J	--	UG/L
NAPHTHALENE	TOTAL	0.2000 - 12	6/11	10.0	2	0.2	12.0	20.0	31.0	--	V	UG/L
TETRACHLOROETHENE	TOTAL	0.2000 - 10	1/10	1.0	0	0.8	5.0	9.2	0.8	--	Y	UG/L
TRICHLOROETHENE	TOTAL	0.2000 - 10	1/10	2.7	1	0.2	5.0	9.3	4.0	J	--	UG/L
VINYL CHLORIDE	TOTAL	0.2000 - 10	2/10	2.0	2	0.2	10.0	18.0	9.0	J	--	UG/L
Water Quality Parameters												
FLUORIDE	TOTAL	100.0 - 1000	10/10	2000.0	1	680	1607	2709	7000	--	V	UG/L

NC - Not Calculated

Shaded cell indicates value exceeds ARAR; comparison of UCL_{95} to ARAR is not performed if UCL_{95} exceeds Maximum Detection.

ARARs Comparison for Seep (SWO97)

Analyte	Total / Dissolved	Detection Limit Range	Detection Frequency	ARAR	Number of Detections Exceeding ARAR	Minimum Result	Mean Result	UCL_{95}	Maximum Detection	Qualifier for Maximum Detection	Validation for Maximum Detection	Units
Metals												
IRON	DISSOLVED	4.7 - 100	9/9	300	9	54700	77356	85248	95800	--	JA	UG/L
MANGANESE	DISSOLVED	1 - 15	9/9	50	9	1300	1417	1456	1500	--	V	UG/L
MANGANESE	TOTAL	1 - 15	9/9	200	9	1320	1438	1477	1520	--	V	UG/L
ZINC	TOTAL	1.8 - 20	9/9	2000	7	857	1974	2371	2630	--	V	UG/L
Radionuclides												
GROSS BETA	TOTAL	2.89701 - 8.7	5/5	8	4	7	12	15	17	--	V	PCI/L
Semivolatile Organics												
NAPHTHALENE	TOTAL	10 - 10	5/5	10	5	14	18	21	22	--	V	UG/L
Volatile Organics												
BENZENE	TOTAL	5 - 5	4/11	1	3	1	2	2	2	J	--	UG/L
CHLOROMETHANE	TOTAL	10 - 10	1/11	6	1	7	5	6	7	J	A	UG/L
METHYLENE CHLORIDE	TOTAL	5 - 5	4/11	5	1	3	5	7	6	B	--	UG/L
VINYL CHLORIDE	TOTAL	10 - 10	2/11	2	2	8	6	7	11	--	V	UG/L

Shaded cell indicates value exceeds ARAR; comparison of UCL_{95} to ARAR is not performed if UCL_{95} exceeds Maximum Detection.

ARARs Comparison for East Landfill Pond (SWO98)

Analyte	Total / Dissolved	Detection Limit Range	Detection Frequency	ARAR	Number of Detections Exceeding ARAR	Minimum Result	Mean Result	UCL_{95}	Maximum Detection	Qualifier for Maximum Detection	Validation for Maximum Detection	Units
Metals												
IRON	DISSOLVED	4.3 - 100	14/14	300	1	8	193	397	1660	--	--	UG/L
MANGANESE	DISSOLVED	1 - 15	11/14	50	7	1	75	112	250	--	V	UG/L
MANGANESE	TOTAL	1 - 15	14/15	200	2	3	104	157	430	--	V	UG/L
Radionuclides												
GROSS BETA	TOTAL	2.57535 - 6.77	6/6	8	5	8	11	13	16	--	V	PCI/L
Volatile Organics												
METHYLENE CHLORIDE	TOTAL	5 - 5	2/15	5	1	4	3	4	8	B	--	UG/L

Shaded cell indicates value exceeds ARAR; comparison of UCL_{95} to ARAR is not performed if UCL_{95} exceeds Maximum Detection.

ARARs Comparison for Wells Downgradient of the Landfill

Analyte	Total / Dissolved	Location	Geologic Unit	Detection Limit Range	Detection Frequency	ARAR	Number of Detections Exceeding ARAR	Minimum Result	Mean Result	UCL_{95}	Maximum Detection	Qualifier for Maximum Detection	Validation for Maximum Detection	Units
Metals														
IRON	DISSOLVED	53194	ALLUVIUM	7.3 - 100	2/5	300	1	7.3	103.0	227.8	303.0	--	V	UG/L
LEAD	TOTAL	53194	ALLUVIUM	0.9 - 5.0	3/5	50	1	1.0	12.9	33.1	50.5	--	JA	UG/L
MANGANESE	DISSOLVED	4087	ALLUVIUM	15 - 15	2/2	50	1	22.9	139.0	864.4	253.0	--	V	UG/L
MANGANESE	DISSOLVED	53194	ALLUVIUM	0.5 - 15.0	4/5	50	1	3.8	25.7	59.4	86.6	--	V	UG/L
MANGANESE	DISSOLVED	B207089	W. BEDROCK	1 - 15	13/15	50	2	3.3	24.0	34.6	60.2	--	V	UG/L
Radionuclides														
GROSS ALPHA	TOTAL	B207089	W. BEDROCK	4.8 - 74.07	2/2	15	1	0.00	10.0	69.5	19.0	--	Y	PCI/L
GROSS BETA	TOTAL	B207089	W. BEDROCK	10 - 21.82	2/2	8	1	3.46	8.0	38.3	13.0	--	Y	PCI/L
Volatile Organics														
CARBON TETRACHLORIDE	TOTAL	B206889	W. BEDROCK	0.2000 - 5	2/15	1	2	0.20	3.00	3.31	7.11	--	Y	UG/L
Water Quality Parameters														
FLUORIDE	TOTAL	4087	ALLUVIUM	100.0 - 100.0	4/4	2000	1	1500	2075	3125	3400	--	--	UG/L
FLUORIDE	TOTAL	53194	ALLUVIUM	100.00 - 100.00	5/5	2000	5	2090	2360	2583	2600	--	Y	UG/L
NITRATE/NITRITE	TOTAL	B206889	W. BEDROCK	20.00 - 10000	10/10	10000	10	82000	144003	161282	190000	--	V	UG/L
NITRATE/NITRITE	TOTAL	B206989	W. BEDROCK	20.00 - 20.00	5/5	10000	5	36000	49600	62367	72000	--	V	UG/L
SULFATE	TOTAL	4087	ALLUVIUM	2000 - 5000	4/4	250000	4	280000	527500	825347	770000	--	--	UG/L
SULFATE	TOTAL	B206889	W. BEDROCK	2000 - 250000	2/2	250000	2	1420000	1510000	2078260	1600000	--	V	UG/L
SULFATE	TOTAL	B206989	W. BEDROCK	5000 - 5000	1/1	250000	1	2600000	2600000	NC	2600000	--	V	UG/L
SULFATE	TOTAL	B207089	W. BEDROCK	1000.00 - 50000	16/16	250000	16	440000	1741020	3756766	19000000	--	--	UG/L

NC - not calculated

Shaded cell indicates value exceeds ARAR; comparison of UCL_{95} to ARAR is not performed if UCL_{95} exceeds Maximum Detection.

Table 1: Fate and Transport Parameters for OU6 Source Simulations

Analyte	K_{oc} (ml/g)	f_{oc}	k_d (ml/g)	ρ_s (g/cm3)	η	R	half lives hrs	k hrs^{-1}
Bis(2-Ethylhexyl)Phthalate	61.66	0.001	0.06	1.77	0.1	2.09	9336	7.42E-05
Benzene	87.1	0.001	0.09	1.77	0.1	2.54	17280	4.01E-05
Carbon Tetrachloride	417	0.001	0.42	1.77	0.1	8.38	8640	8.02E-05
Chloroform	43.7	0.001	0.04	1.77	0.1	1.77	43200	1.60E-05
Tetrachlorethene	263	0.001	0.26	1.77	0.1	5.66	17280	4.01E-05
Trichloroethene	107	0.001	0.11	1.77	0.1	2.89	39672	1.75E-05
Barium	nd	0.001	nd	1.77	0.1	1.00	nd	nd
Beryllium	nd	0.001	nd	1.77	0.1	1.00	nd	nd
Cadmium	nd	0.001	nd	1.77	0.1	1.00	nd	nd
Chromium	nd	0.001	0.2[a]	1.77	0.1	4.54	nd	nd
Copper	nd	0.001	4.5[a]	1.77	0.1	80.65	nd	nd
Lead	nd	0.001	0.2[a]	1.77	0.1	4.54	nd	nd
Manganese	nd	0.001	nd	1.77	0.1	1.00	nd	nd
Nickel	nd	0.001	nd	1.77	0.1	1.00	nd	nd
Selenium	nd	0.001	nd	1.77	0.1	1.00	nd	nd
Silver	nd	0.001	nd	1.77	0.1	1.00	nd	nd
Zinc	nd	0.001	0.1[a]	1.77	0.1	2.77	nd	nd
Fluoride	nd	0.001	nd	1.77	0.1	1.00	nd	nd

KEY:

K_{oc} Organic carbon coefficient (Knox et al. 1993)

f_{oc} Fraction of organic carbon in the soil matrix: geometric mean value based on values for Qrf, af, and Qvf (DOE 1994)

k_d Soil-water distribution coefficient

η Effective porosity (DOE 1995)

R Retardation coefficient

k First Order Decay Coefficient (Howard et al. 1991)

nd No data

a EPA 1978; DOE 1992

Table 2: Groundwater Contaminant Transport Parameters and Simulated Results at the Compliance Boundary: 30 Year Continuous Source Simulation from the OU6 Trenches

Analyte	v	α_L	α_T	Molecular Diffusivity	ω	k	R	Source Concentration	Simulated Concentration (µg/L) at the Compliance Point	ARAR
	ft/day	(ft)	(ft)	(m^2/sec)		hrs-1		µg/L	1,125 ft From the Source	µg/L
Barium	0.3	60	1.9	1.00E-09	0.05	0.00E+00	1	5060	101.47	1000
Beryllium	0.3	60	1.9	1.00E-09	0.05	0.00E+00	1	32	0.64	2
Cadmium	0.3	60	1.9	1.00E-09	0.05	0.00E+00	1	19	0.38	5
Chromium	0.3	60	1.9	1.00E-09	0.05	0.00E+00	4.54	580	0.34	50
Copper	0.3	60	1.9	1.00E-09	0.05	0.00E+00	80.65	6430	<1.0	1300
Lead	0.3	60	1.9	1.00E-09	0.05	0.00E+00	4.54	193	0.11	50
Manganese	0.3	60	1.9	1.00E-09	0.05	0.00E+00	1	6200	124.33	200
Nickel	0.3	60	1.9	1.00E-09	0.05	0.00E+00	1	1070	21.46	100
Selenium	0.3	60	1.9	1.00E-09	0.05	0.00E+00	1	220	4.41	20
Silver	0.3	60	1.9	1.00E-09	0.05	0.00E+00	1	3040	60.96	70
Zinc	0.3	60	1.9	1.00E-09	0.05	0.00E+00	2.77	8000	80.61	2000
Fluoride	0.3	60	1.9	1.00E-09	0.05	0.00E+00	1	2400	48.13	2000
Bis(2-Ethylhexyl)Phthalate	0.3	60	1.9	1.00E-09	0.05	7.42E-05	2.09	12	<0.1	10
Benzene	0.3	60	1.9	1.00E-09	0.05	4.01E-05	2.54	3	<0.1	1
Carbon Tetrachloride	0.3	60	1.9	1.00E-09	0.05	8.02E-05	8.38	12	<0.1	1
Chloroform	0.3	60	1.9	1.00E-09	0.05	1.60E-05	1.77	10	<0.1	6
Tetrachloroethene	0.3	60	1.9	1.00E-09	0.05	4.01E-05	5.66	2000	<0.1	1
Trichloroethene	0.3	60	1.9	1.00E-09	0.05	1.75E-05	2.89	2630	<0.1	2.7

Key:

v Seepage Velocity; Based on site specific hydraulic conductivity (0.36 ft/day) , hydrailic gradient using well pair 7087/4087 (0.08) and effective porsity (0.01) values

α_L Longitudinal dispersivity

ω Tortuosity coefficient

k First order decay coefficient (Howard et al. 1991)

R Retardation coefficient

ARAR Applicable or relevant and appropriate requirements

NA Not applicable

Source concentrations based on maximum values at monitoring wells 7287, B206589, B206489

Transport distance (x) measured from the source to the compliance points

Source width boundaries: X=Y=Z=1

Shading indicates chemical exceeds ARAR at the compliance boundary

Table 3: Groundwater Contaminant Transport Parameters and Simulated Results at the Compliance Boundary: 30 Year Continuous Source Simulation from OU7 Seep Source

Analyte	v ft/day	α_L (ft)	α_T (ft)	Molecular Diffusivity (m2/sec)	ω	k hrs-1	R	Source Concentrations[1] Mean (ug/L)	Source Concentrations[1] Maximum (ug/L)	Range of Concentrations at the Compliance Points[2] 537 ft	Range of Concentrations at the Compliance Points[2] 1073 ft	ARAR (ug/L)
Benzene	3.65	60	1.9	1.00E-09	0.05	4.01E-05	21.81	NA	5	<0.01	<0.01	1
Vinyl Chloride	3.65	60	1.9	1.00E-09	0.05	1.00E-05	1.59	NA	10	0.3	0.2	2
Bis(2-Ethylhexyl)Phthalate	3.65	60	1.9	1.00E-09	0.05	7.42E-05	23896.00	NA	11	<0.01	<0.01	10
Naphthalene	3.65	60	1.9	1.00E-09	0.05	1.12E-04	308.77	NA	31	<0.01	<0.01	10
Methylene Chloride	3.65	60	1.9	1.00E-09	0.05	1.43E-07	3.08	NA	6	<0.01	<0.01	4.7
Trichloroethene	3.65	60	1.9	1.00E-09	0.05	1.75E-05	26.57	NA	5	0.03	<0.01	3
Manganese	3.65	60	1.9	1.00E-09	0.05	nd	1	2749	8000	233 80	165 57	200
Iron	3.65	60	1.9	1.00E-09	0.05	nd	1	77356	NA	2460	1740	300
Arsenic	3.65	60	1.9	1.00E-09	0.05	nd	1	NA	74.7	0.6	<0.01	50
Cobalt	3.65	60	1.9	1.00E-09	0.05	nd	89.5	NA	16.2	0.5	0.3	10
Fluoride	3.65	60	1.9	1.00E-09	0.05	nd	25.78	NA	2000	58	41	2000
Zinc	3.65	60	1.9	1.00E-09	0.05	nd	2.77	NA	2630	84	59	2000

Key

v Seepage Velocity; Based on site specific hydraulic conductivity (7.3 ft/day) , hydrailic gradient (0.05) and effective porsity (0.01) values

α_L Longitudinal dispersivity

ω Tortuosity coefficient

k First order decay coefficient (Howard et al. 1991)

R Retardation coefficient

ARAR Applicable or relevant and appropriate requirements

NA Not applicable

1 Source concentrations based on mean and maximum values at monitoring well 72293 or SW097

2 Transport distance (x) measured from the source to the compliance points

Source width boundaries: X=Y=Z=1

Shading indicates chemical exceeds ARAR at the compliance boundary

Summary of OU 7 Options and Alternatives

Process Options

Landfill Cap	Landfill Gas	Groundwater			Sediments
		Containment	Collection	Treatment	
Assume Cover Landfill Footprint Remove Dam and Pond **Cap Cross Section** Option A Option B Option C Option D	Passive Active	No Action Slurry Wall	No Action Wells Drain	No Action Existing OU 1 facility OU 7 Conventional facility OU 7 Passive facility	Consolidate under cap
Assumes no risk from surface soils in spray evaporation areas, subsurface geologic materials downgradient of the landfill and downgradient groundwater.					

Alternatives

Alternative 1: No Action

Alternative 2: Institutional Controls

Alternative 3: Cap, Passive Gas Collection and Monitoring, Consolidation of Sediments

Alternative 4: Cap, Passive Gas Collection and Monitoring, Slurry Wall, Consolidation of Sediments

Alternative 5: Cap, Passive Gas Collection and Monitoring, GW Collection and Treatment, Consolidation of Sediments

Alternative 6: Cap, Passive Gas Collection and Monitoring, Slurry Wall, GW Collection and Treatment, Consolidation of Sediments

Recommended Alternative

To Be Determined based on evaluation using seven CERCLA Criteria

Attachment 3
DES-001-96
Page 1 of 1

John Jankousky	Stoller	546 4412
Susan Evans	RMRS ER	966-3199
Carl Spreng	CDPHE	692-3358
Nina Churchman	EPA	312-6481
John Hopkins	RMRS ER	966 4974
Doug Ikenberry	CDPHE	692-3309
Steve Hahn	Kaiser Hill	966-2588
Mary Eisenbeis	Stoller	546-4474
Laurie Peterson-Wright	RMRS ER	966-8553